DOCUMENT RESUME

ED 427 752 IR 019 403

AUTHOR	Davies, Randall S.; Mendenhall, Robert
TITLE	Evaluation Comparison of Online and Classroom Instruction for HEPE 129--Fitness and Lifestyle Management Course.
PUB DATE	1998-08-17
NOTE	26p.
PUB TYPE	Reports - Evaluative (142)
EDRS PRICE	MF01/PC02 Plus Postage.
DESCRIPTORS	Academic Achievement; Comparative Analysis; *Computer Assisted Instruction; Conventional Instruction; *Distance Education; Educational Environment; Educational Quality; Educational Technology; Health Education; Higher Education; *Instructional Design; *Instructional Effectiveness; *Lecture Method; Physical Education; *Student Attitudes; Student Needs; Student Surveys; Tables (Data); Teaching Methods; World Wide Web
IDENTIFIERS	Brigham Young University UT

ABSTRACT

This evaluation compared online (i.e., World Wide Web-based) and classroom instructional delivery methods for the Health Education/Physical Education course, "Fitness and Lifestyle Management," at Brigham Young University (Utah). The results of the study were intended to add to the discussion on the value of web-based courses as a means of providing quality instruction. A comparison of online and classroom students' achievement for specific lessons of the course show that the test scores were not significantly different. This indicates that either method for providing instruction could satisfactorily be used to learn course content when students fully participate and use the materials provided. A large majority of students who took online instruction indicated a definite opinion about which learning experience they preferred. Most students tended to prefer the classroom experience; however, students' reasons for choosing one method over the other had little to do with the quality of instruction. An individual's personal situation, social issues, and the perceived benefits of a specific delivery method were often the determining factor in a student's preference. It was clear that neither the classroom nor the online instruction fully met the learning needs of all students. The diverse needs of students warrant the existence of classroom courses with equivalent online courses. It was concluded that the university should continue to use and improve quality classroom instruction as they look to alternative methods for providing other quality learning experiences such as online instruction. (Contains 11 tables and 20 references.) (Author/AEF)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED 427 752

Evaluation Comparison of Online and Classroom Instruction for HEPE 129 - Fitness and Lifestyle Management Course

Evaluation Project
Department of Instructional Psychology and Technology
Brigham Young University

by

Randall S Davies M.S.
Robert Mendenhall
August 17, 1998

ABSTRACT

This evaluation compared online and classroom instructional delivery methods for the Health Education/Physical Education course HEPE 129 - Fitness and Lifestyle Management. As our ability to provide instruction over the web is a relatively new phenomenon, the results of this study are intended to add to the discussion on the value of web based courses as a means of providing quality instruction.

A comparison of online and classroom students' achievement for specific lessons of the course show that the test scores were not significantly different. This leads us to believe that either method for providing instruction could satisfactorily be used to learn the content of this course when students fully participate and use the materials provided.

While test results were not significantly different, a large majority of students who took online instruction did indicate a definite opinion about which learning experience they preferred. Most students tended to prefer the classroom experience; however, the students' reasons for choosing one method over the other had little to do with the quality of the instruction provided. An individual's personal situation, social issues and the perceived benefits of a specific delivery method were often the determining factor in a student's preference.

It was clear that neither the classroom nor the online instruction fully met the learning needs of all students. The diverse needs of students warrant the existence of classroom courses with equivalent online courses. We conclude that the University should continue to use and improve quality classroom instruction as they look to alternative methods for providing other quality learning experiences such as online instruction.

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)
☐ This document has been reproduced as received from the person or organization originating it.
☐ Minor changes have been made to improve reproduction quality.
• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

BEST COPY AVAILABLE

PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
R.S. Davies
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC).

IR019403

Table of Contents

Introduction 1
- Relevance of this Study 1

Review of Relevant Literature 2
- Instruction and Learning 2
- Elements of Good Instruction 2
  - Introductory activities 2
  - Gaining attention and motivational elements 3
  - Review 3
  - Clear presentation of information 3
  - Discussion 3
  - Guided learning 3
  - Eliciting performance and providing feedback 3
- The Human Factor 4
- Teaching in the Classroom 4
  - Advantages 4
  - Disadvantages 4
- Technology and Teaching 5
  - Advantages 5
  - Disadvantages 5
- Changing Attitudes and Behavior 5

Description of the Evaluand 6
- Classroom Experience 6
- Online Experience 6
- Identifying Differences 7
  - Assessment 7
  - Interaction with classmates 7
  - Optional modules 7
  - Fitness appraisal 7
- HEPE 129 Course Objectives 8

Evaluation Questions 8

Method 9
- Participants 9
- Assessment 9
- Evaluation Groups 9
- Survey Questionnaires 9
- Classroom Visits and Focus groups 9
- Data Analysis 9

Limitations 10

Results 10

Conclusions 16
- Student Performance 16
  - Do students using different methods for delivering this instruction achieve similar results on assessment instruments currently being used in the on-campus course? 16
- Student Attitudes and Behavior Question 16
  - Do students feel their attitudes and behavior have changed after having taken this course? 16
- Value of Instruction Questions 16
  - Do students use the instructional resources available? 16
  - Do students prefer one delivery method more than the other? 17
  - Do students find one method of instruction more useful than the other? 17

Discussion 18
- HEPE 129 Online 18
- Time and Pace 18
- Human Interaction 19
- Recommendations 20

References 21

Evaluation Comparison of Online and Classroom Instruction for HEPE 129 - Fitness and Lifestyle Management Course

Evaluation Project
Department of Instructional Psychology and Technology
Brigham Young University

by

Randall S Davies M.S.
Robert Mendenhall
August 17, 1998

Evaluation Comparison of Online and Classroom Instruction for HEPE 129 - Fitness and Lifestyle Management Course

INTRODUCTION

The Health Education/Physical Education course HEPE 129 - Fitness and Lifestyle Management is a 2.0 credit course offered to meet the Wellness requirement for general education students at Brigham Young University (BYU). In conjunction with instructors currently teaching HEPE 129 on campus, the Independent Studies department at BYU has developed an online version of the course. The online course is accessed over the World Wide Web. This evaluation compares the two methods of delivering the instruction for the HEPE 129 course. As our ability to provide instruction over the web is a relatively new phenomenon, the results of this study are intended to add to the discussion on the value of web based courses as a means of providing quality instruction.

Relevance of this Study

The current enrollment of the HEPE 129 course for Fall and Winter semesters averages about one thousand students. With five or six sections of this course each semester, the class sizes often exceed two hundred students. The Health and Human Performance department at BYU has recently allowed BYU enrolled, degree-seeking students to take the Independent Study online course for credit. Both courses cover the same basic objectives in thirteen independent modules or lessons; both require students to complete similar additional learning activities; yet the methods for providing the instruction are quite different.

There may be benefits and disadvantages to both delivery methods. This study attempts to determine the degree to which these two methods of delivering instruction for this course help students accomplish the objectives of the course. This is important for Independent Study because their mandate is to provide quality online courses. This is important for the department of Health and Human Performance because they hope to find that students taking the online course are being provided with a satisfactory learning experience.

For the purposes of this evaluation, we will need to distinguish between these two methods of delivering instruction for this course. We will refer to the Independent Study version of this course as the *Online Experience*. The course as it is currently delivered on campus we will refer to as the *Classroom Experience*.

REVIEW OF RELEVANT LITERATURE

Instruction and Learning

A clear distinction needs to be made between learning and instruction. They are not the same things. Learning has been defined as the retention and understanding of knowledge and skills as well as the use of this knowledge and skill (Jonassen, 1988). Instruction is a planned learning experience. Students receive various types of instruction in hopes that they will learn. When students receive quality instruction it enhances the likelihood that learning will take place (Gagne, 1992). Quality instruction refers to both completeness in covering the desired learning objectives and usefulness to the students as a tool for accomplishing their learning. Improving the amount and quality of instruction can result in more effective and efficient learning (Walberg, 1994). It should also be noted that even when presented with quality instruction, it is possible that students will not learn.

Our ability to determine precisely why students learn is often quite difficult in educational research as it is virtually impossible to control all the factors that affect learning (Gay, 1996). We can however evaluate the quality of the instruction provided based on quantitative and qualitative evidences available. This can be done for instruction delivered in the classroom or by the computer.

Elements of Good Instruction

Several studies have compared computer-assisted instruction with traditional instruction. Many of these studies have shown increases in learning when students use computer assisted instruction (Jonassen, 1988). However, using advanced technologies does not automatically guarantee quality instruction and learning (Zhao, 1998). This is the case whether technology is used as a supplementary activity in the classroom or as the sole method of instruction. The design and content quality of the instruction must be considered for both online and in-class instruction.

While it is difficult to accurately predict whether learning will take place or to measure learning that has taken place, it is possible to identify elements of good instruction. Gagne, Briggs, & Wager (1992) indicate that the inclusion of certain educational elements in instruction will increase the chances that learning will occur.

Introductory activities. Carefully designed introductory activities can have a great affect on students' motivation for learning. Such activities might include advance organizers or an introduction to the learning objectives. Any procedure that clearly organizes or outlines the learning that is to take place will influence what and how the student learns. Student's attention and willingness to learn should increase when the physical and logical layout of the instructional material is improved (Harley, 1976). Not only do these organizational activities influence what students learn but also their attitude towards the material being taught.

Gaining attention and motivational elements. It is important to get students' attention and interest in the instruction being provided. Keller (1983) and Jones (1990) suggest that instruction should be designed to include creative, imaginative, and critical thinking activities along with relevant instruction as a means to improve student performance. Other motivational instructional strategies might include real life simulations, projects or apprenticeships (Reigeluth, 1996). In order for students to learn, they must find the instruction relevant and interesting. The inclusion of motivational elements will improve student satisfaction and desire for learning; it can be an effective way to increase learning (Dick, 1990).

Review. Reminding learners of previously learned material can help students learn new material. This is especially important when the previously learned material is an essential prerequisite to the new material (Gagne, 1992). Dick and Carey (1990) indicate that the development of prerequisite and subordinate skills always facilitate learning.

Clear presentation of information. Instructional information and material must be presented in a way that does not deter learning. The likelihood that learning will occur is diminished when the information to be learned is confusing or difficult to follow. The lesson information must also be appropriate for the target audience. Students tend to put less effort into their work when they perceive that a task required of them is too difficult (Weiner, 1992). In addition, expectancy theory suggests that when students believe their success or failure is attributed to outside influences, like inadequate instruction, they tend to put less effort into their work (Keller, 1983). One way to improve learning is to make sure that instructional information is presented in a clear manner.

Discussion. Group discussions can be a powerful medium for learning (Collins, 1994). Understanding increases when students are required to organize their thoughts and present them to others. Effective discussions can take place electronically online or verbally in small groups. Often this type of learning situation requires a moderator.

Guided learning. Learning is more efficient when students are given direction. A guided exploration of the subject to be learned will improve the chances that students will learn the desired instructional outcomes. In addition, a report on the effectiveness of technology in schools (1997) indicates that many students learn more when they are allowed some control over the amount, review, and sequence of instruction. Most learning situations are more effective when the instruction guides the learners as needed.

Eliciting performance and providing feedback. Another element of good instruction which Dick and Carey (1990) indicate always facilitates learning is practice with feedback. Providing feedback involves more than informing students what mark they received on a test. Unfortunately, tests are often only used to determine what has been learned, rarely are they used as a learning experience for students (Collins, 1994). Part of any course's instructional strategy should involve building skills using gradually

more difficult assignments and then emphasizing the importance of effort. All instruction should have a formative evaluation strategy that includes practice with feedback.

The Human Factor.

Research into courseware design and learner motivation has shown that motivated learners are often able to overcome the shortcomings of inadequate instruction (Keller, 1988). These motivated learners utilize a variety of coping skills and exert persistent effort in order to achieve their learning goals. Bereiter and Scardamalia (1993) label such individuals intentional learners. Whatever the label, intentional learners end up learning despite the barriers of the learning environment and the inadequacies of the instruction.

Current studies have found that most college students are not intentional learners. They are performing learners or conforming learners (Martinez, 1998). Performing learners are skilled learners who do what is needed to get the grade. They are task-oriented and rarely learn beyond what is required. They are usually able to overcome most of the imperfections of inadequate instruction. Performing learners achieve their best results when provided with quality instruction.

Conforming learners are less skilled learners who require step-by-step instructions and are satisfied to simply complete assigned work. They expend little effort beyond the minimum requirements and have simple standards for themselves. Conforming learners are often adversely affected by poor instruction.

Teaching in the Classroom.

A common criticism of distance-education from campus instructors is that it delivers information but does not develop understanding. It is a common opinion that students prefer in-class group instruction and that classroom instruction is more effective (Bates, 1994). However, the nature of the *classroom experience* dictates which elements of good instruction can be used effectively. The class size, time restrictions, classroom conditions and the lesson content often limit what can be done. These factors will affect the amount of learning that takes place.

Advantages. In a classroom situation with a large class size, the most effective and most utilized method for delivering instruction is the lecture. A skilled lecturer uses many techniques to gain attention, motivate students, and direct the learning. He or she is able to review important prerequisite learning and might use a variety of pre-instructional activities to organize and introduce the learning. Experienced lecturers can also adjust the presentation of the instructional information to meet the immediate needs of the students.

Disadvantages. Instruction in large groups goes contrary to mastery learning proposed by Bloom (1976). Group discussion is impractical, practice with personalized feedback is difficult to accomplish, and classroom conditions or the amount of information and the amount of time available sometimes adversely affect the instructor's presentation.

What is learned in the classroom depends heavily on the instructor. Not all instructors are good lecturers. Research indicates that student evaluations of courses do not accurately indicate the value and quality of the instruction as much as it does the competence of the instructor (Marsh, 1994).

Technology and Teaching.

Although computers have proven to be an effective method for delivering instruction, too often those who use the web as a method for delivering instruction simply extend what is already being done in the classroom. Quality online instruction must include elements of good instruction in such a way as to benefit from the potential advantages of the medium. In addition, the technology must be made as transparent as possible, it must take advantage of a variety of integrated teaching tools, and it should reduce data and help manage it (Zhao, 1998). If the online instruction is simply being implemented as a page-turner, a textbook may better serve the purpose.

Advantages. Carefully designed online instruction can utilize a variety of techniques to gain attention, motivate students and direct the learning. Online instruction can provide review of important prerequisite learning and might use a variety of pre-instructional activities to organize and introduce the learning.

Additional benefits of using computer assisted instruction include the ability to efficiently deliver multi-media information. Students can control the sequence and pace of the learning. Learning need not take place at a predetermined time and place. Quick access to alternate sources of information on the web can be provided; this information can be selected on the basis of an individual's needs and learning goals. Personalized learning can be accomplished with the use of expert systems. Group discussion is possible through instructional chat lines and bulletin boards. Immediate personalized feedback on assessment is possible.

Disadvantages. Computer related hardware problems could occur. Poorly designed user interfaces may actually deter students from accessing the instruction; this would have a detrimental effect on learning. Information is sometimes difficult to read when appropriate information chunking techniques are not used.

Changing Attitudes and Behavior

An important aspect of learning involves students using knowledge and skills they acquire. Behavior is determined by one's attitude and this cannot be measured directly. How students use the knowledge and skills they have learned is an indication of attitude towards a specific topic. Attitude is measured by the direction and magnitude of student behavior. The purpose of instruction, as it relates to attitudes, is to make students aware. It is hoped that by making students aware of correct principles and social issues they will adapt their attitudes and behavior in a beneficial way.

Anyone can state a view or show understanding of a specific value then act against that view in a conflicting situation (Walberg, 1994). Conforming and performing learners often show evidence that learning has taken place only for the duration of a specific course.

DESCRIPTION OF THE EVALUAND

Classroom Experience

The *classroom experience* is a traditional lecture driven model for giving instruction. Students are provided with a syllabus on the first day of class that provides an outline for the course. The course is divided into eighteen lectures that are referred to as modules. A different specialist instructor teaches each lecture. Students are tested on thirteen of these modules and must attend three of five elective modules. Students are not tested on the elective modules but an in-class quiz is given to record attendance. Six exams covering two or three modules each are administered through the BYU testing center.

Students are required to complete several activities in addition to the module examinations. Students must participate in a physical fitness appraisal. This consists of a blood test and pre-test/post-test fitness appraisal at the beginning and end of the semester. Students also sign an exercise contract and complete an exercise log.

There are two required textbooks for the course and students are given reading assignments for each lecture. Selected modules have reading material that can be obtained from the reserve library on campus or from the BYU Electronic Reserve System over the World Wide Web.

Online Experience

The content for the *online experience* was provided by various instructors of the HEPE 129 course and is intended to reflect the course taught on campus. Students access the Independent Study server and this course using the World Wide Web. There are thirteen lessons that students must take to complete the course. Students are provided with a set of four CD-ROM disks that contains video clips and animations intended to help teach the various lessons.

Students are also required to participate in a physical fitness appraisal. This consists of an optional blood test and pre-test/post-test fitness appraisal at the beginning and end of the course. Students sign an exercise contract and complete an exercise log.

All the material for the course is provided online. Students scroll through the materials provided and can access video clips, animations, sound clips, graphics and Web links that provide access to other online resources. In addition, the *online experience*

provides a "did you know" feature that gives interesting facts related to the lesson. The *online experience* features immediate feedback on lesson assignments and grade information as well as online processing of the fitness assessment forms.

Identifying Differences

Assessment. The *online experience* provides graded lesson tests called "Speedback" exercises. These tests provide immediate feedback to the student telling them how well they answered questions about material in the lesson. Speedback exercises are open book. These exercises can only be taken once and are worth sixty five percent of the final grade. The exercise contract, exercise log and fitness appraisals make up fifteen percent of the grade. There is an open book comprehensive final exam worth twenty percent of the final grade. The final examination is a proctored paper and pencil test.

Students participating in the *classroom experience* take examinations at the testing center on campus. Each exam covers two or three modules and is a closed book test. Students can retake each exam twice for a fee of $3.25 each time. The retake examination is an alternate form of the test. Students can review the exam questions they missed prior to retaking an examination. Module exams are worth seventy percent of the final grade. Fifteen percent of the final grade comes from students attending a minimum of three elective modules. The exercise contract and exercise log makes up fifteen percent of the final grade. Students are also required to complete the fitness appraisal pre-test and post-test.

Interaction with classmates. The *online experience* for this course has a bulletin board system that allows students to post messages to one another. Using the course discussion board is optional. Students are not required to use this feature to complete the course. The *classroom experience* allows for some in-class discussion.

Optional modules. Students in the *classroom experience* are required to attend three of five elective modules. These modules include Marriage and Family Relations, Women's Health, Environmental Health, Maintaining a Healthy Weight, and Crisis Intervention. The *online experience* has no elective module requirement.

Fitness appraisal. Students participating in the *classroom experience* must sign up for an appointment to have the fitness appraisal completed. Fitness appraisals are completed outside of regular class time and are administered by trained staff. This appraisal requires that students give a blood sample for analysis. Students record the results of the fitness appraisal on a fitness questionnaire. The questionnaire is submitted and processed. Students receive the results approximately one week later.

With the *online experience*, students complete the fitness appraisal on their own following instructions provided. They are not required to give a blood sample. The fitness results are recorded on a fitness questionnaire and processed immediately by the computer.

HEPE 129 Course Objectives

The stated objective for the HEPE 129 course is to have students learn correct principles of health and physical fitness. Students will then apply these principles in designing and following a personalized fitness and lifestyle management program.

EVALUATION QUESTIONS

Several important and interesting questions emerged during initial discussion with stakeholders associated with this evaluation. Some questions cannot readily be answered given the conditions imposed on this study. This evaluation will focus on

- The effectiveness of online and in-class instruction for teaching the principles of health and fitness as outlined in the HEPE 129 course.
- The degree to which the instruction changes students' attitudes about health and fitness.
- Advantages and disadvantages of the two methods of instruction.

The study will attempt to determine whether any significant difference can be found in test results and student feedback for the alternative methods of instruction used to provide information in this course.

Student Performance Question.

1. Do students using different methods for delivering this instruction achieve similar results on assessment instruments currently being used in the on-campus course?

Student Attitudes and Behavior Question.

2. Do students feel their attitudes and behavior have changed after having taken this course?

Value of the Instruction Questions.

3. Do students use the instructional resources available?
4. Do students prefer one delivery method more than the other?
5. Do students find one method of instruction more useful than the other?

METHOD

Participants

Participants for the evaluation study were invited to participate on a voluntary basis from HEPE 129 students who enrolled in the course in the 1998 summer semester. Volunteers agreed to take four or five of the HEPE 129 lessons online. This was intended to give them experience with both methods of instruction.

Assessment

Students in the current summer course were required to take six exams in the testing center. Each exam covered material from two or three lessons in the course. The study focused on the seven lessons associated with exams three through five. All students took the same examinations in the testing center.

Evaluation Groups

Volunteer students were randomly divided into three groups. Two groups studied the content for a specific module using the online lesson material only. One of the three groups remained in the classroom to receive the classroom version of the instruction. This was done on a rotating basis for each of the three exams to counter any inequity in the groups unintentionally caused by the group selection technique.

Survey Questionnaires

A questionnaire was attached to the end of each exam associated with the study. Students responded to questions about how they prepared for the exam, their reaction to the instruction and whether they felt they had learned something from the lessons.

Classroom Visits and Focus groups

Classroom visits were made to collect attendance information and to make observations. Focus groups and interviews were conducted to obtain data from online and in-class students.

Data Analysis

Data was gathered from test results for both in-class and online students. Mean scores and standard deviations were calculated for each group. A measure of statistical significance was used to calculate the effect size. In addition, survey results were tabulated; classroom observations and interview information was organized by topic in order to identify issues and trends.

LIMITATIONS

There were several restricting circumstances that affected how we conducted this study. Only two students were enrolled for the full online course due to the fact that the course had just been made available to students. The low enrollment meant we were not able to obtain adequate data from students taking the online course as the sole means of instruction. Because of this, this evaluation did not study a full implementation of the online course. This means that we were not able to make a comparison of course completion rates and of the overall online learning experience.

The design of the study reflects the limitations we faced. Specifically, this study compares seven online lessons to their corresponding classroom lessons. As a result, some of the data we collected may not necessarily describe differences in the two delivery methods but rather it may describe the course in general. We did not use the online lesson exams, fitness assessment, the exercise log or the online final examination. Thus we could not assess the effectiveness of these aspects of the course. We were, however, able to make comparisons in student performance on specific lessons and student preferences for instructional methods. A study using the fully implemented online course is something that will have to take place when the numbers of students choosing that option increases.

In addition, we make the assumption that the assessment instruments being used by classroom teachers are valid for this course. Other than an item analysis to determine the degree of difficulty for each item, we did not complete an evaluation of the testing instruments used. We would have preferred that both groups take both the classroom and online exams but the logistics of this were impractical. It is possible that using the classroom examinations may be a disadvantage or an advantage for one of the groups. Using only the one set of exams was justified in that students are given course credit for passing the classroom exams in their current state. These exams presumably represent what students need to know whether they took the instruction online or in the classroom.

RESULTS

There were one hundred and thirteen students initially enrolled in the summer semester of HEPE 129. Ninety-six students were in attendance when we solicited student participation in the study. Thirty-nine students volunteered to participate by taking online lessons. About fifteen student volunteers indicated they would be taking the lessons on their home computer. The remaining students had access to computer labs on campus. Table 1 shows the group sizes for each examination. Table 2 shows the break down of students in each group by year in school.

All students taking examinations one, two and six were assigned to take the instruction in the classroom. Actual group numbers for exams three, four and five were determined from questionnaire results. Only those students who clearly indicated that they completed the relevant lessons exclusively online or in the classroom were used. Table 3 gives the examination results by group for each of the six exams.

Table 1

Group Sizes *

Exam Period	Number of Students			
	Total	Online		In Class***
		Assigned	Actual**	
Start of the course	113	--	--	--
First Exam	110	--	--	--
Second Exam	109	--	--	--
Third Exam	110	25	18	85
Fourth Exam	107	26	16	76
Fifth Exam	106	27	13	74
Sixth Exam	104	--	--	--

* based on number of students taking exams with the exception of the initial enrollment
** includes only those who clearly indicated that they completed the lessons exclusively online
*** includes only those who clearly indicated that they completed the lessons exclusively in class

Table 2

Group Demographics by Exam Taken

Examination	Year in College							
	Online				In Class			
	1st	2nd	3rd	4th	1st	2nd	3rd	4th
First	--	--	--	--	58	13	5	24
Second	--	--	--	--	58	13	5	24
Third	35 *	35	6	24	64	8	6	23
Fourth	33	27	7	33	66	8	5	21
Fifth	57	7	14	22	60	12	4	24
Sixth	--	--	--	--	58	13	4	25

* Number represents the percent of all students taking the exam who were in their first year at BYU

Table 3

Mean and Standard Deviation of Tests by Group

Exam	All Students		Online		In-Class	
	Mean*	S.D.	mean	S.D.	mean	S.D.
Body Mind Spirit & Substance Abuse	82.7	8.6	--	--	--	--
Cardiovascular Health	80.1	14.3	--	--	--	--
Cardiorespiratory & Muscular Fitness	82.4	11.0	79.6	10.8	82.4	10.8
First Aid/Emergency Care & Human Sexuality	81.1	10.5	81.1	8.8	81.2	10.8
Immunity & Infection, Cancer & Nutrition	83.1	10.9	82.9	10.2	83.6	10.8
Consumer Health & Stress Management	71.5	13.7	--	--	--	--

* based on highest retake mark

The effect size calculations shown in Table 4 provide a measure for comparing examination results of the online and in-class groups. The measurement indicates that the resulting means vary by 26% of one standard deviation for exam three, 1% of one standard deviation for exam four, and 17% of one standard deviation in exam five. According to Cohen's (1977) rule of thumb, the practical significance of these differences is low to moderate. This indicates that factors other than the method of instruction account for a large portion of the variability in the results (Toothaker, 1996).

Table 4

Measure of practical significance

Assessment	Effect size
Exam Three	.26
Exam Four	.01
Exam Five	.17

At the end of each exam students were asked to indicate how well they prepared themselves to take the examination. This was meant to give an indication as to how fully students participated in the instruction provided. Students from each group were then divided into two subgroups – students who participated fully in the instruction and those who only partially made use of the instruction provided. We expected that students would do better if they actually used the instruction provided. If no difference was noticed then that method of instruction may be ineffective.

Students who indicated full in-class participation included those who said they attended every class and did some or all the readings. Students who participated fully in the *online experience* included those who said they completed all the readings, self-check questions, Speedback tests, and looked at some additional links. Partial in-class participants included those who said they did some of the reading and attended some of the classes. Partial on-line participants included those who indicted that they did the readings only. Table 5 shows the achievement results by group. As expected, students who utilized the instruction more fully achieved better results but only slightly better. The improvement in learning tended to be only one or two questions on any given exam.

Table 5

Mean Scores Based on Participation by Group

	Full Participation		Partial Participation	
Assessment	Online	In-class	Online	In-class
Exam Three	86	84	77	77
Exam Four	83	83	76	76
Exam Five	83	85	81	79

Attendance was taken as part of the classroom observations. Attendance results are shown in Table 6. On average 107 students took each exam but only 87 students attended class or took the lessons online. From these observations we conclude that as many as 30 students failed to attend any given class but still took the exam.

Table 6

Classroom Attendance

Class	Start of Lecture	0–5 min late	5–10 min late	10–30 min late	30+ min late	Total in attendance	Left class early
July 8 [a]	93			1	2	96	2
July 10 [bc]	56	5				61	
July 20 [bc]	59	7	3	4		73	
July 22 [bc]	54	6	3	1		64	1
July 27 [bc]	57	11	1	1		70	
July 31 [bc]	42	6	16	9		73	
Aug 3 [c]	47	19	8	6		80	
Aug 10 [a]	66	6	5	6	4	87	16

[a] pre/post fitness assessments handed out in this class [b] Viewed first 30 min of class only [c] This class occurred during the study

From the secretary of HEPE we learned that there is a general trend for class attendance. At the beginning of the semester attendance is the highest. Attendance drops off considerably in the middle of the course and increases again towards the end of the semester. This is consistent with our observations. In addition, we see that the overall classroom attendance did not increase very much after the students taking online lessons were scheduled to return to the classroom.

After each exam students were asked to describe their learning experience (see Table 7) and whether they felt they had learned anything that had motivated them to change their lifestyle (see Table 8). The results were fairly consistent between groups. Of significance is the fact that about half of the students in both groups felt they learned many things in the lesson that they planned to use. Over 60% of both groups indicated they had learned something in the lesson that motivated them to change their lifestyle.

Table 7

Questionnaire Results for the Question Asking Students to Describe What They Learned.

Response	Online	In-class
Little I didn't already know	15 %	7 %
Some but not significant	10 %	12 %
Some but not relevant to me	27 %	27 %
Lots, which I intend to use	48 %	54 %

Table 8

Questionnaire Results for the Question Asking Students If They Had Learned Anything that Motivated a Change in Lifestyle.

Response	Online	In-class
Yes	62 %	67 %
No	38 %	33 %

Based on an item analysis of the examination questions, we found that some questions tended to favor one group over the other. There were three versions of each exam for a total of 363 questions for exams three, four and five. For each question the degree of difficulty was calculated by group. There were 71 questions that favored one group or the other by a degree of difficulty of 0.2 or more. Of these, 23 questions favored the online group and 48 favored the in-class group. In fact, several students in both groups commented that the examinations tested content that the instruction didn't cover. Several classroom students felt they got mixed information from instructors and as a result didn't know what to answer on some questions. Many students using the online material felt that there was too much information to learn and that there should be more direction as to what they needed to study and what was going to be tested on the exam. Correspondingly, 52% of the online students felt the instruction didn't prepare them very well for the exams while 56% of the in-class students indicated that the classroom instruction prepared them about the same as most instruction does for exams. A summary of these results is shown in Table 9.

Table 9

Questionnaire Results for the Question Asking Students to Describe How Well the Instruction Prepared Them for the Exam.

Response	Online	In-class
Not very well	52 %	19 %
About the same as most instruction	33 %	56 %
Slightly better than most instruction	10 %	11 %
Very well	4 %	14 %

Of those students who chose not to take online lessons, 27% indicated that they preferred the *classroom experience* because they felt they would get important exam hints and helps in class that they wouldn't get online. Some instructors actually presented test questions and answers verbally in class. The fact that the *online experience* did not provide specific information regarding test preparation may have affected students' perceptions of how well the instruction prepared them for the exam.

Technology problems were identified as a possible concern early in the study. Students who took the online lessons were asked whether they experienced any problems with the technology. Table 10 shows the student responses. Several students indicated that they had problems with the videos from the CD-ROM disks provided. Most were unaware that there were four CD-ROM disks and had only obtained one of the four. Other problems included not having a sufficiently current Internet browser to access the lessons and using inadequate hardware.

It should be noted that the classroom lecturers also experienced recurring problems with technology. Some of the problems included having difficulty with PowerPoint presentations, projector problems, and squealing or non-functioning microphones. Some of the problems were minor; others delayed or otherwise affected the presentation.

Table 10

Questionnaire Results for the Question Asking Students to Describe Problems with the Online Technology.

Response	Percent of Online Students
It was a real problem	17 %
I had some difficulty	35 %
I had minor problems	24 %
No problems	24 %

Many of the online students indicated that, while taking the lessons, they had questions that they would like to have asked. Some of the questions were about the technology and others were about the course. A few who did ask questions via email indicated the technical responses they received from Independent Studies were helpful. When asked about this, classroom students said that they also had questions they would like to have asked. Some felt they shouldn't waste other students' time during class and would approach the instructor afterwards. Others felt that in a large class they had very little access to the instructor.

After completing a group of online lessons, students were asked whether they would prefer to finish the course in the classroom or online. Table 11 gives a summary of the student responses.

Table 11

Questionnaire Results for the Question Asking Students How They Would Prefer to Finish the Course.

Response	Percent of Online Students
In the classroom	57 %
Online	16 %
Either would be fine	27 %

CONCLUSION

Student Performance

Do students using different methods for delivering this instruction achieve similar results on assessment instruments currently being used in the on-campus course? Based on the measures of practical significance, the test scores were not significantly different. This leads us to believe that either method for providing instruction could satisfactorily be used to learn the content of this course.

Student Attitudes and Behavior Question.

Do students feel their attitudes and behavior have changed after having taken this course? About two thirds of the students indicated they had learned something that motivated them to make a lifestyle change. In general, there seemed to be a high level of enthusiasm for this course. Several students indicated that they found the course to be a lot better than they expected it would be. Most were optimistic that the changes they were making in their lifestyle would be permanent. This optimism was found in both groups but due to the limitations of the study's design, this optimistic attitude may speak more to the course in general and not to differences in instructional delivery methods.

Value of the Instruction Questions.

Do students use the instructional resources available? Clearly not all students are accessing the available instruction. Classroom attendance was often low and many online students did little more than read the materials presented. This however did not always translate into poor grades. Even students who indicated that they did only minimal preparation for examinations tended to achieve adequate scores. The exam retake policy, previous knowledge and student's coping skills may be reasons for this. The results did tend to show that, with either experience, learning is more likely to take place when students participate fully. This would indicate that both methods of instruction could lead to adequate learning if fully experienced.

Do students prefer one delivery method more than the other? Of those students who participated by taking online lessons, 73% had a definite opinion about which experience they preferred. Overall, 57% of the students indicated that they preferred the *classroom experience*. Some said they enjoyed the association of friends and classmates. Others indicated that they remember things they have heard better than things they have read. They also enjoyed the entertainment aspect of the live instruction. Several students indicated that they needed the structure of a regularly scheduled class in order to be successful at their studies. Others said that they didn't have easy access to a computer and that if they had to come on campus to study they might as well attend class.

Most students who indicated that they preferred the *online experience* enjoyed the flexibility. Some couldn't commit to attending class at a set time for personal reasons. Others felt it would save them time doing the lessons online.

While more than half the students who participated in the *online experience* indicated they would prefer to take subsequent lessons in the classroom, the students' reasons for choosing one method over another seemed to have little to do with the quality of the instruction. An individual's personal situation, social issues and the perceived benefits of the specific delivery method were often a determining factor in a student's preference.

Do students find one method of instruction more useful than the other? While students taking the lessons online tended to feel that the instruction didn't prepare them very well for the exam, their performance was not noticeably affected. Many students who indicated they preferred classroom instruction said that their choice was largely influenced by the fact that exam hints given in class better prepared them for the tests. Most students felt they could learn either way but preferred to be told specifically what they needed to know for the exams. It is clear that a part of the *classroom experience* included lecturers emphasizing content that would be covered on the exam.

DISCUSSION

Neither method of instruction provided for this course is perfect, and students found cause to criticize both. Both instructional systems did however do an acceptable job of meeting the objectives of the course. Students learned correct principles of health and physical fitness and they were expected to apply those principles in designing and following a personalized fitness and lifestyle management program. As an added bonus, students also tended to enjoy the course and felt that they were making positive lifestyle changes.

HEPE 129 Online

Although some problems exist that need to be worked out, the online course for HEPE 129 is a well-designed course; not every online course is. As well as the required course information, this online course has a wealth of additional learning opportunities that unfortunately may go unused by the performing and conforming learners taking this course. Many students commented that there was just too much information to look at and that they skipped videos and Internet links that they felt wouldn't benefit them on the exam. Still the additional resources are there for those that wish to use them.

In addition to the amount of information, students felt that they needed help with exam preparation. This may have occurred because this study did not utilize the entire online course. The online assessments are open book and the final assessment does have a "how to prepare for the exam" section. In addition, the objectives for each lesson are clearly provided. Still the design of the course might be improved by clearly identifying the principles of health and fitness that students are required to know for the exam.

There were also some specific programming problems that will need to be corrected. Specifically, the Speedback tests for some lessons malfunctioned and did not allow students to submit their answers. The navigation buttons for some of the pages failed to move students to the appropriate pages. The labels on the CD-ROM disks need to be standardized so videos will work on Macintosh and Windows based computers. These problems will no doubt be corrected as field testing of the course is carried out.

Time and Pace

One of the greatest benefits of taking the course online is the flexibility of being able to work on a lesson when it is convenient. Students can control the time and pace of the instruction. This flexibility is an extremely important advantage for many students. One potentially problematic side effect of this flexibility is the likelihood that students will not find a convenient time to work on lessons. Course completion rates are something that this study was not able to track. However, based on research of distance learning and other computer assisted learning programs, this may be a problem.

The classroom provides structure for some students and thus course completion rates using classroom instruction are often higher than those using online instruction. Students have been trained to attend class and use this as a means of organizing their daily schedule. The problem with this is that the learner has little or no ability to control the pace of the instruction or the amount of time they can spend with the instruction. Several students indicated that circumstances sometimes prevented them from attending class. In addition, some lectures used poorly designed slides that were ineffective or hard to read. Some students often fell asleep in class or were distracted by conditions in the classroom such as parents bringing young children to class. As one student put it "How do I make up for a class I miss?" One way might be to make both methods of instruction available to students.

From an instructional provider's point of view, we need to eliminate as many barriers to learning as we can. Ideally, students would be able to access those things they like about the classroom instruction and optionally have the flexibility of using online resources as needed.

Human Interaction

Another issue that needs to be addressed is that of communication. Discussion has been identified as an important aspect of learning (Collins, 1994), yet how do students get access to instructors in order to discuss course content? This isn't a problem unique to online courses but also exists in most large classroom situations. It would be impractical for one person to answer hundreds of students' e-mails every day. It is equally impossible for a professor to speak personally to two hundred students after class.

Currently Independent Study does have a person who answers questions about the technology. It is likely that as more students enroll online this will not be enough. The online course has been designed as a self-study course and thus doesn't provide students with instructor access to answer their course content questions.

The classroom course has a similar communication problem. Because of the structure of the course, many different professors teach each section. No one professor is responsible for a particular section. The HEPE secretary normally handles most student concerns but many students commented that they found it difficult to get information about the administrative details of the course. Many students noted that it was "comforting" to have the HEPE coordinator attend each class. This was possible in the summer session but will not be feasible in the winter and fall sessions when the number of sections increase from one to possibly five. Ideally class sizes would be kept small enough that an instructor could have personal contact with each student. This is not likely to happen as the number of students attending the University increases.

Some potential solutions for both methods of instruction might be to maintain a site that provides answers to frequently asked questions. Many organizations promote a tutor system intended to provide a "human touch" to their distance learning materials. This is something that Independent Study may wish to consider. Another partial solution might be to create a moderated chat site for the course. The online version of this course does have a student bulletin board system available; however, none of the students accessed it during the study. Most students indicated that they would be happy to receive an e-mail response to their questions as long as it was within twenty-four hours of having asked the question. Any solution for this communication problem should take into account the need for students to discuss course content and get information about the course as well.

Recommendations

As the number of students wishing to attend BYU increases, alternative means of instruction should be considered. It is clear that one method of instruction alone will not meet the needs of all students. The diverse needs of students warrant the existence of the classroom courses and equivalent online courses. While students tended to prefer the *classroom experience*, for some students, well-designed online instruction may better meet their needs.

Whether technology is used to enhance classroom instruction or as the sole medium of instruction, there is a possibility that problems will occur. In our classroom courses and in distance learning courses, we need to continue to incorporate elements of instruction that promote learning. Our ability to provide effective online instruction will increase as technological advances are made and as we learn to better apply methods of instructional design. As quality online courses are developed, they will play an important part in the future of education.

REFERENCES

Bates, A.W. (1994). Educational technology in distance education. The international encyclopedia of education, 3, 1573 – 1579.

Bereiter, C. & Scardamalia, M. (1993). Surpassing ourselves: Inquiry into the nature and implications of expertise. Chicago: Open Court.

Bloom, B. S. (1976). Human characteristics and school learning. New York: McGraw-Hill.

Cohen, J. (1977). Statistical power analysis for the behavioral sciences. New York, NY: Academic Press Inc.

Collins, A., Greeno, J. G., & Resnick, L. B. (1994). Learning environments. The international encyclopedia of education, 6, 3298.

Dick, W. & Carey, L. (1990). The systematic design of instruction. (3rd ed.) Glenview, IL: Scott, Foresman and Company.

Gagne, R. M., Briggs, L. J., & Wager, W. W., (1992). Principles of instructional design, (4th ed.) New York: Harcourt Brace Jovanovich

Gay, L. R. (1996) Educational research. (5th ed.) Englewood cliffs, NJ: Prentice hall.

Harley, J. & Davies, I. K. (1976) Preinstructional strategies: The role of pretests, behavioral objectives, overviews and advanced organizers. Review of Educational Research, 46, 239-265.

Keller, J. M. (1983). Motivational Design of Instruction. In C. M. Reigeluth (Ed.), Instructional design theories and models: an overview of their current status (pp.386-430). Hillsdale, NJ: Lawrence Erlbaum Associates.

Keller, J. M. & Susuki, K. (1988). Use of ARCS motivational model in courseware design. In D. H. Jonassen (Ed.), Instructional designs for microcomputer courseware. Hillsdale, NJ: Lawrence Erlbaum Associates.

Jonassen, D. H. (1988). Instructional designs for microcomputer courseware. Hillsdale, NJ: Lawrence Erlbaum Associates.

Martinez, M. (1998) Intentional Learning. [Online]. Available: http://mse.byu.edu/projects/elc/ilprojects.html Viewed July 15, 1998.

Marsh, H. W. (1992). Student evaluations of teaching. The encyclopedia of educational research (6th ed.), 10, 6229 - 6230.

Reigeluth, C. (1996). A new paradigm of ISD? Educational Technology, 36(3), 13-20

Report on the effectiveness of technology in schools, 1995-1996: Executive summary. (1997). [Online]. Available: http://www.spa.org/project/edu_pub/summary.htm Viewed July 15, 1998.

Toothaker, L. E. & Miller, L., (1996). Introductory statistics for the behavioral sciences. Pacific Grove, CA: Brooks/Cole Publishing Company.

Walberg, H. J. (1994). Personality, school and Social environment as learning determinants. The international encyclopedia of education, 8, 4400 – 4404.

Weiner, B. (1992). Motivation. The encyclopedia of educational research (6th ed.), 3, 860.

Zhao, Y. (1998). Design for adoption: The development of an integrated web-based Education Environment. Journal of Research on Computers in Education, 30(3), 307-328.

BEST COPY AVAILABLE